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Proceedings of the Newfoundland and Labrador Regional Advisory Process for the Review of the Gilbert Bay Marine Protected Area monitoring indicators, protocols and strategies, and an assessment of the Gilbert Bay cod population.

October 22, 2009
Holiday Inn, 180, Portugal Cove Road
St. John's, NL

Dr. Robin M. Anderson
Meeting Chairperson

N. D. Templeman
Editor

Compte rendu du processus de consultation scientifique régional de Terre-Neuve et du Labrador sur l'examen des indicateurs, des protocoles et des stratégies de surveillance de la zone de protection marine de la baie Gilbert et sur l'évaluation de la population de morue de la baie Gilbert.

Le 22 octobre 2009
Holiday Inn, 180, Portugal Cove Road
St. John's, T.-N.-L.

Dr. Robin M. Anderson
Président de réunion

N. D. Templeman
Réviseur scientifique

Fisheries and Oceans Canada / Pêches et Océans Canada
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July 2010 | **Juillet 2010**

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made at the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenues dans le présent rapport puissent être inexactes ou propres à induire en erreur, elles sont quand même reproduites aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considérée en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

The Regional Advisory Process (RAP) for the review of the Gilbert Bay Marine Protected Area (MPA) Monitoring Protocol took place at the Holiday Inn, St. John's, NL on October 22, 2009. Under the Health of the Oceans (HOTO) initiative, DFO Science is required to provide support and advice on Marine Protected Areas to DFO Oceans Management. Currently, this includes identifying indicators, protocols and strategies that are to be incorporated into MPA monitoring plans to be carried out by Oceans. Given that Science in support of the Gilbert Bay initiative has been ongoing (both pre- and post-MPA designation) for several years, this RAP will require taking into consideration the indicators, protocols and strategies that have been used to date, advising on their suitability for measuring against the existing conservation objectives (COs) for Gilbert Bay, identifying other potentially important indicators, protocols and strategies where required, and if appropriate, assessing trends in the available indicator data to assess the status of the Gilbert Bay cod population. Participants in this process included DFO Science (NL and Quebec Region), DFO Oceans (NL Region), Department of Fisheries and Aquaculture (DFA), Memorial University of Newfoundland (MUN), Food, Fish and Allied Workers (FFAW) and Labrador Metis Nation (LMN). The Terms of Reference were addressed during this meeting and a CSAS Science Advisory Report (SAR), Research Document and Proceedings document will be the products of this meeting.

SOMMAIRE

Le processus de consultation scientifique régional (PCSR) sur l'examen du protocole de surveillance de la zone de protection marine (ZPM) de la baie Gilbert a eu lieu le 22 octobre 2009 au Holiday Inn, à St. John's, T.-N.-L. En vertu de l'initiative Santé des océans, le secteur des Sciences du MPO doit donner formuler des avis sur les zones de protection marine à la demande de Gestion des océans du MPO et lui offrir un soutien. À l'heure actuelle, l'aide apportée par le secteur des Sciences consiste à relever les indicateurs, les protocoles et les stratégies qui doivent être intégrés aux plans de surveillance des ZPM, lesquels seront mis en œuvre par Gestion des océans. Étant donné que le secteur des Sciences offre un soutien pour l'initiative de la baie Gilbert (avant et après la désignation de la ZPM) depuis plusieurs années, il faudra, dans le cadre du présent PCSR, prendre en considération les indicateurs qui sont déjà utilisés et formuler un avis sur leur capacité à mesurer les objectifs de conservation de la baie Gilbert ainsi que relever d'autres indicateurs qui peuvent être importants. Il faudra également, le cas échéant, examiner les tendances dans les données dérivées des indicateurs pour évaluer l'état de la population de morue de la baie Gilbert. Parmi les participants, mentionnons des représentants des secteurs des Sciences (Régions de T.-N.-L. et du Québec) et de Gestion des océans (Région de T.-N.-L.) du MPO, du ministère des Pêches et de l'Aquaculture, de l'Université Memorial de Terre-Neuve (MUN), de la Food, Fish and Allied Workers (FFAW) ainsi que de la nation Métis du Labrador. Au cours de la réunion, l'ensemble des aspects du cadre de référence ont été abordés. Un avis scientifique (AS), un document de recherche et un compte rendu seront produits après la réunion.

INTRODUCTION

The Chair, Dr. Robin Anderson (Research Scientist, Ecological Sciences) commenced the meeting with a round of introductions. The agenda (Appendix I) and Terms of Reference (Appendix II) for the meeting were reviewed. The Chair informed participants that the Canadian Science Advisory Process is a participatory process requiring input and discussion on the information presented at the meeting. A consensus option is developed and responses that the meeting participants agree upon will be put forward. This Proceedings report will be published documenting the discussions that took place. A Science Advisory Report (SAR; DFO 2010) containing recommendations developed by the group, as well as a Research Document (Morris and Green 2010), will also be published on the DFO CSAS website.

A working paper was developed and circulated prior to the meeting and provided the basis of information to address the Terms of Reference for this meeting. The overall objectives of the meeting were to:

- Determine if the indicators, protocols and or strategies identified by science are appropriate to monitor the Gilbert Bay cod population against the Conservation Objectives (COs) for the Gilbert Bay MPA.

- If the current indicators are deemed appropriate, analyze the resulting data to characterize the status and trends for the local cod population as it relates to the COs for the Gilbert Bay MPA.

Specifically, five proposed indicators related to the Gilbert Bay cod population were assessed, and advice to accept and/or improve the various indicators was developed. The five indicators proposed for use in monitoring the Gilbert Bay cod population were:

1. Recruitment of age 0 pelagic juvenile abundance
2. Recruitment, relative abundance, and year class strengths based on age 2,3 and 4 year old Gilbert Bay cod
3. Research Catch Per Unit Effort (CPUE)
4. Movement patterns in relation to population demographics and MPA boundaries
5. Localized commercial, recreational, sentinel, and aboriginal catch rates and fishing effort.

MEETING PROCEEDINGS

The meeting proceeded with presentations providing background and context to MPA initiatives in general and to the Gilbert Bay MPA specifically, followed by a presentation and discussion on existing indicators, protocols and strategies for the current Gilbert Bay Monitoring program.

DFO SCIENCE REQUIREMENTS UNDER HEALTH OF THE OCEANS (HOTO)

Presenter: Nadine Templeman, DFO Science Branch, NL Region

Summary

Oceans Act Marine Protected Areas (MPAs) have a history dating back to the Oceans Act of 1997. Subsequent strategies, plans and initiatives that support MPAs as a management strategy include the Framework for Integrated Management (2002), the Oceans Action Plan

(OAP; 2005), and the Health of the Oceans initiative (HOTO; 2007) – where the key principles among these are sustainable development, integrated management, the precautionary approach, and ecosystem-based science and management.

Monitoring of biological and ecological indicators (and their respective threats) in MPAs is essential (and useful) towards: incorporation into broader MPA monitoring "plans" or "programs"; tracking status, condition and trends to determine if MPAs are effective in achieving their COs; aiding mangers in the adjustment of MPA management plans to achieve COs; and reporting to Parliament and Canadians.

In support of the HOTO initiative, DFO Science is required to deliver indicators, protocols, and strategies for monitoring the individual COs for established MPAs. The provision of indicators should include the consideration of both "direct" and "indirect" indicators of the status of the component being considered, while the provision of a monitoring protocol should consider survey design, and collection and analysis techniques that resemble a "recipe" for clients/stakeholders/users that are/could be responsible for the actual monitoring activities within (and/or surrounding) the MPA. Finally, strategies should be presented as the potential for implementation of the protocol and should consider the collection of data/information by non-DFO staff (e.g., academia, etc.) and communities and should provide associated guidance on QA/QC, training, partnerships, and potential problems. Identifying timelines for the periodic review of these indicators, protocols and strategies is also important to adequately support MPAs.

Discussion

There were no questions from participants on this presentation. The Chair remarked that this presentation was helpful and gives a general framework for the task with regards to Marine Protected Areas (MPAs) in Canada at the moment. Compared to other Canadian MPAs, Gilbert Bay is leading with respect to the long-term collection of data and information and the currently established monitoring protocol; many other Canadian MPAs are in the development stage in this regard. The existing protocol and recommended changes or further work to improve upon this work will be addressed during this meeting.

OCEANS MONITORING REPORT ON GILBERT BAY MPA
Presenter: Jennifer Janes, DFO Oceans Branch, NL Region

Summary

The Gilbert Bay Marine Protected Area (MPA) was designated under the *Oceans Act* in 2005. This bay, on the southeast coast of Labrador, was designated to conserve and protect a unique resident population of Atlantic cod. The Oceans Division of Fisheries and Oceans Canada (DFO) is responsible for the management of MPAs in the Newfoundland and Labrador Region. A Management Plan outlining COs and management actions was released in 2007. The CO for the Gilbert Bay MPA is to "conserve and protect the Gilbert Bay cod population and its habitat". The monitoring of the Gilbert Bay cod population is one of the management actions outlined in this plan. Gilbert Bay cod research by MUN and DFO scientists started prior to the closure of the MPA and has since developed into the cod monitoring program. A monitoring report outlines the strategies, indicators and a protocols used to assess the cod population and presents the general trends and results, in addition to monitoring other aspects of the marine environment. Oceans Division is interested in a peer review of the Gilbert Bay cod monitoring program indicators to ensure it meets the COs for the MPA (evaluating MPA effectiveness). If

modifications are required they will be incorporated in future monitoring plans. Potential modifications will also be factored into the MPA Management Plan review in 2010.

Discussion

There was no discussion or questions from participants on this presentation.

GILBERT BAY COD MONITORING PROGRAM
Presenter: Corey Morris, DFO Science Branch, NL Region

Summary

Gilbert Bay, Labrador has been closed to commercial fishing for Atlantic cod (*Gadus morhua*) since 1999, and in 2005 it was designated a Marine Protected Area (MPA) under Canada's *Fisheries Act* and *Oceans Act*, specifically to protect the genetically distinctive population of Atlantic cod. Demographic characteristics of the cod population and the movement patterns of individual fish have been studied continuously since 1998. Here we describe data used to derive 5 indicators of population change: 1) recruitment of age 0 pelagic juveniles, 2) recruitment of ages 2, 3, and 4 year old fish, 3) research catch per unit effort, 4) movement and migration patterns, and 5) catch data from commercial, sentinel, aboriginal, and food fishing. In recent years there has been a low abundance of age-0 pelagic juveniles. Fish comprising relatively strong cohorts have grown in size under protective regulations but recruitment of cod ages 2, 3 and 4 years has been poor since 2003. Research catch per unit effort (CPUE) has declined. Tagging and tracking data from external tags and implanted sonic transmitters show that fish < 40 cm generally exhibit high site fidelity while an unknown proportion of larger fish migrate to the outer parts of the Bay, which can include areas well outside the MPA boundaries. Concurrent with the decline, there has been an increase in fishing effort and the amount of fish caught in areas adjacent to the MPA

Key-words: Marine Protected Area, Atlantic cod, recruitment, population demographics, Newfoundland and Labrador.

Discussion

Throughout the presentation there were questions of clarification and discussion.

Indicator 1: Recruitment of age 0 pelagic juvenile abundance

The age 0 pelagic juvenile sampling is done at the same time every year. The presenter was asked if it is possible to separate out year class strength versus the difference between a time, when there would be peak number of individuals? The premise of this question probably relates to the extended spawning period of many Atlantic cod populations, resulting in an extended period of juvenile availability in the water column. While this may be possible with additional sampling, there is a difference between Gilbert Bay and Smith Sound (where other cod monitoring occurs) with respect to the specificity of the timing of spawning. The timing of spawning seems to be short in duration and consistent from year to year in Gilbert Bay – spawning occurs during spring through the freshet period and as land-fast ice melts from the bay, during May and June. It is felt that sampling time is optimal for the amount of effort that is available to collect the data. Subsequent sampling in August captures pelagic juveniles between 15-35 mm, during which time no cod eggs are sampled, suggesting that the timing of spawning (or survival) is more contracted for Gilbert Bay cod than for other cod populations.

One participant made the comment that when sampling was done in 2005 in both the Main Arm and the Shinneys, most of the juveniles were sampled in the Main Arm (Zone 1; Figure Appendix V) of Gilbert Bay, and asked why in 2007 and 2008 there was no sampling in the Main Arm. In general, sampling in the main arm is limited because of time and resources. The point was made that due to the data from 2005 it is useful not to neglect the Main Arm area in terms of monitoring in the future. Pertinent questions regarding the significance of sampling from the Main Arm of Gilbert Bay were asked. If there is a significant abundance of young pelagic juvenile cod in the upper part of the Main Arm could there be an abundance of spawning cod there too? Are there fish missed due to lack of sampling in the main arm? It was noted that there was some sampling throughout the Bay (not in recent years) but there were always more fish in the Shinneys, and the feeling that this has not changed. It was agreed that additional effort in 2010 will be made to sample the main arm of Gilbert Bay for both adults and juveniles.

It was noted that it is difficult to correlate the data from this sampling protocol with year class size (ages 2, 3, 4). Since there is an overlap between the year classes more sampling may be required to see that 2 year old are actually 2 year olds. A straight correlation of the strong year classes in 2001 and 2002 does not exist.

A question was also posed concerning the consistency of the sampling. Plankton tow sampling is consistent from year to year. Sampling consists of 20-30 tows each year using the same type of net. Each tow is 15 minutes in duration and conducted at the same locaitons and depths each year. Boat speed and tow distance is measured using a hand held GPS Clogging of the net is usually not an issue, except for some encounters with jelly fish when the net has to be cleaned. In 2009, depth and temperature sensors were added to the net, which verified consistency and accuracy of the sampling depths.

Indicator 2: Recruitment, relative abundance, and year class strengths based on age 2,3 and 4 year old Gilbert Bay cod

A participant asked if the sampling data is from the same areas and at the same time of year. These data are from overwintering areas (collected during the May-June spring sampling) and it is the belief that all size classes are available. The same lures are used each year and the data presented is only from the Shinneys.

Since researchers chose not to kill increased numbers of fish (only 20 fish killed each year) due to the local small population, there is limited otolith data to measure length-at-age for each year class in each year of sampling.

There was some commercial fishing in this area over some of the years that will be addressed later in the presentation (indicator 5).

Sampling occurs in the Shinneys because many Gilbert Bay cod overwinter there each year. It was questioned whether there was evidence that the Upper Arm is not an overwintering area. Acoustic telemetry, hook and line sampling effort, and tagging (2000/2001) has indicated that few fish are found in the Upper Arm of Gilbert Bay during spring, and few sonically tagged fish use this area. However, a comparative analysis could be conducted again to see if there are any changes in catch rates in those other areas, compared to other years. The acoustic listening stations in the Upper arm and Middle arm has indicated that fish tagged in The Shinneys do not spend considerable time in this area.

A participant noted that an important message to management should be that Gilbert Bay has an area of 55 km², and that sampling by two people with hook and line is insufficient to determine trends in abundance of Gilbert Bay cod, due to a sampling design that is stretched too thin.

The comment was also made that it is hard to know if the data is presenting more than one year class. Fish larger than 25-30 cm have increasing variability in individual length at age. The presenter said that the intention is to show a pattern, but identification of modes is a potential problem (not appropriate even) without a significant amount of otolith data. It was therefore suggested that when looking at the modes of the demographics of the data it seems to be a bit of a stretch to highlight the strong year classes but rather better to look at the periods of weak year classes as a suggestion.

Indicator 3: Research Catch Per Unit Effort (CPUE)

It was questioned whether there is any estimate of variability in this indicator or if CPUE is an average? The presentation of data for this indicator was based on a summary of the number of fish caught at multiple sites per rod-hour of fishing each year within The Shinneys. Essentially the catch rate is based on the number of people and hours fished. To improve inferences based on research catch rates, measuring variability among sites and years was suggested.

Indicator 4: Movement patterns in relation to population demographics and MPA boundaries

The presenter wanted to stress the trend over time of site fidelity and how this is important when thinking about movement patterns. Despite a figure that shows approximately 50% of fish not returning to the same location, it was explained that the scale is 500-1000 m, therefore the fish still return to or stay within the Shinneys area. The fish are staying and returning to the Shinneys and show a site-specific behaviour. It was questioned if this site fidelity exists at a population basis (i.e. like salmon). Do all fish return to the Shinneys, or is it a fraction of the population? The presenter stated that 90% of all large fish return to within 1000 m and continue to have site specific behavior over several years (4-6 yr period). This behavior is displayed from small to larger fish. Acoustic data show that smaller fish (30-35 cm) have short foraging arrays but stay within the same area year round. At the scale that is being discussed (5 km²) it shows that a lot of the fish use the same area and researchers continue to monitor behaviour using acoustic telemetry. Individual fish are likely moving around the Shinneys. The information presented shows that 80% of the time the population is more likely to be found at a certain site in the Shinneys; but could be using other areas at another point in time. This is trying to demonstrate components of the behaviour of the population that could influence the overall movements of the population depending on the populations demographic structure. Larger fish leave the Shinneys in summer. There are interesting movement patterns in the data that have relevance for monitoring and management implications. For example, where the fish move will influence what management decisions will be made for the MPA.

'Initial capture' is defined by where fish are tagged and 'recapture' is defined by where tagged fish are recaptured with a rod. Spatial and temporal data exist for both of these. When it was questioned how sample size compares to the originally tagged fish, it was noted that the ratio of re-captured fish from a particular tagging experiment is low, and in general, the recapture rate is consistent from year to year.

A participant noted that during the summer sampling there are fewer larger fish caught, so where are they? It appears that in the spring there is a good representation of the range of year classes. The participant wondered about the difference between the two sets of data.

It was questioned whether there had recently been a lot of big fish in the Shinneys during spring? Comparing the proportion of larger fish to smaller fish this was true, but not compared to the proportions of 1998. The participant then asked how to explain recent low recruitment? At the request of the Chair a graph was to be prepared for the afternoon session presenting the data in numbers as opposed to proportions, as the proportions have changed over time and the actual numbers look like they have also changed, but not in the same pattern as the proportions. The presenter noted that there does not seem to have been a large increase in numbers of spawning fish. Therefore it is his expectation that these are the fish that are being caught in commercial fishery.

It was questioned whether there is a difference on a gender specific basis? A lot of these fish are males (60-70% males or higher) which may have a link to the behavior being displayed. Notably, females may not feed as much when approaching spawning periods.

Fish greater than 55 cm were presented in the length frequency distribution of Gilbert Bay cod recaptured during commercial fishing activities in the vicinity of Gilbert Bay from 1998 until 2008 since that is the average size being caught and recorded in the commercial gillnet fishery. It was asked whether the sampling is catching enough 55+ cm fish to track any kind of relative abundance? In response it was noted that using 55 cm describes the size range of fish that are being captured commercially and shows the Gilbert Bay cod that are available to the fishery. The suggestion was made to redo the length frequency distribution and only include commercial fishing outside the MPA because the figure currently leads to the thinking that small fish were moving out of the MPA – however, that is not necessarily true.

There is a concern with the (decreasing) trend observed in the proportion of commercial-sized fish in the Shinneys in August. It was noted that during 2003-05 there was no fishing outside the MPA and that there were big fish in the Shinneys later in the summer at that time. However, in years during which there was fishing outside the MPA there were no big fish in the Shinneys. Discussion led to the comment that this information should be expressed by CPUE for large fish versus small fish, i.e. need catch rate per unit effort for fish greater than 55 cm.

Indicator 5: Localized commercial, recreational, sentinel, and aboriginal catch rates and fishing effort

The data has been presented using 55 cm, 45 cm and 40 cm fish. It was suggested that the presenter prepare a figure for the afternoon session with fish above 40 cm, or some measure that could increase understanding, and that would capture the size fish that are migrating outside the MPA boundary. Current monitoring presents an issue with not being able to tease out the fraction of the catch that could be Gilbert Bay cod from the commercial fishery. However, there is some potential for that to be dealt with using genetic analysis in the future. A participant asked if there is any idea what proportion of the commercial catch is Gilbert Bay cod? The participant circulated a paper before the meeting containing a model for Gilbert Bay population dynamics that says that even with a normal natural mortality (.2/year) there should not be a harvest more than 10 tonnes, and no more than 7.5 tonnes with a 0.3 natural mortality. Therefore, within an order of magnitude, the commercial fishery could be affecting this population. For these reasons it is important to know how much of the commercial catch is Gilbert Bay cod. It was questioned whether this information would try to be determined with tag

recaptures. However, the current focus is to obtain that data genetically (if possible) as coloration of fish has not proven useful in this respect in the past.

The same participant noted that they participated in research that looked at the Gilbert Bay cod movement inside and outside the MPA two years ago using a coloration index. This provided an indication that Northern cod was moving into the Bay. It was suggested that one of the things that should be considered is whether or not Northern cod move into the Bay and dilute the genetic variation of the Gilbert Bay cod – causing an unsteady state in genetics. The presenter agreed this could potentially occur, but is not necessarily the case.

Discussions moved to whether recreational catches were significant/negliable in relation to commercial catches (i.e. a minimum number of tonnes)? While the data does not exist to answer that question, it *is* known that when commercial fishing caught 18 tonnes in 1998, the recreational fishery caught 1 tonne. Additionally, before 1992 there was a family fishing in that area that likely affected the local cod population. When monitoring began in 1998, following 7 years of fishing moratorium, research catch rates were the highest observed in the 11 year time series, However, the largest decrease in catch rate was observed following the 1998 fishery during which commercial fishing was conducted directly within Gilbert Bay.

From seasonal sampling and acoustic telemetry it appears the migratory behavior (i.e. GB cod moving outside the MPA boundaries) of Gilbert Bay cod begins when fish are larger than 40 cm TL. Questions that remain surrounding this phenomenon include:, do fish larger than 40-50 cm spend more time outside the Main Arm? How frequently? Do they move straight out of the Bay to spend more time outside MPA? If these bigger fish are moving out of The Shinneys to feed on capelin (i.e. at headlands), is it known when they are moving back into the MPA boundaries?

By Fall (September/October/November) fish are observed back in the MPA and the Shinneys. In June/July they again move outside the Shinneys. It was noted that DFO could use these dates to implement management controls if these are spawning fish that are moving outside the MPA to feed. Once fish get to large size (65 cm) their individual movement patterns increase their susceptibility.

It was noted by a participant that in 2004 it appeared capelin moved toward shore during June/July (i.e. Williams Harbour) spawned and left at the head lands. Since capelin are a major reason for Gilbert Bay cod to come and feed at the head lands what are they feeding on outside of the MPA boundary? While that question could not be answered, Gilbert Bay cod certainly feed on other species as temporal patterns vary from year to year within the Shinneys and Gilbert Bay area.

Given all the place names discussed during the meeting it was suggested that a clearly labeled map with be included in the working paper. It was felt that this is important to understanding the scale of the movements of fish.

General Discussion of *Gilbert Bay Cod Monitoring Program (C. Morris)* presentation:

Previous to 2008 acoustic receivers only existed inside the MPA boundaries. Data from these suggested there were not enough receivers to identify specifically where the fish were moving. Therefore, the number of receivers was increased in 2009 and the data will be collected during the fall. The tagging design included the use of 20 small fish (35 cm) and 20 large (50 cm) to be tagged, transplanted and released. It was noted by the principle investigator that we should be

considering adaptive monitoring, including, acoustic telemetry and genetic sampling to monitor Gilbert Bay cod in the commercial catch.

Many questions about the movement of the Gilbert Bay cod population can be answered with telemetry, including when cod leave and return if a sufficient number of transmitters are used. This has been done in Smith Sound (by DFO) and provides data on movement and what numbers are being caught outside Smith Sound. However, the difficulty with this strategy is the expense and number of fish needed to be tagged to get useful data. For example, if 100 fish were tagged in Smith Sound and 95% left for some part of the summer, potentially 10% are caught in commercial fishery and returned to DFO. This does provide a minimal survival estimate for the following year from Smith Sound, and therefore provides potential for this technique to be used in Gilbert Bay with the appropriate number of tags.

The Chair questioned whether, if based on the work in Smith Sound and comments made about telemetry in Gilbert Bay, telemetry should be explored as a monitoring indicator in itself or whether it is the purpose that this could help interpret the indicators that are proposed? In general, it was felt that this technique serves both as a monitoring indicator and useful information to interpreting the other indicators. It was noted that the majority of the costs associated with telemetry are in the receivers and that much of that network already exists. Other associated costs include retrieving them once a year and putting the transmitters in fish. The presenter stated that the idea is to move in the direction of using telemetry information to monitor the indicators. It was noted that the Gilbert Bay cod population is very small (much smaller than Smith Sound), and therefore can be affected quite largely by population swings of a few tonnes either way due to natural year to year variability, commercial and recreational fishing.

After looking at the figure of the proportion of Gilbert Bay cod larger than 55 cm sampled during spring and summer sampling, the group discussed what the data meant in terms of real numbers, in relation to the research catch per unit effort changes, and whether the pattern was the same for fish greater than 55 cm or driven by all fish of commercial size catch (>40 cm). The primus is that fish > 40 cm move more. A problem with the data is, that for fish greater than 40 cm, we do not know where they distribute themselves. Additionally, the representation of fish greater than 55 cm were small in the sample size and it was not certain if this is significant enough to show trends in the data.

The presenter used data from 1998-2008, separated by spring and summer, and plotted research CPUE, as well as the numbers and percentages of fish > 55 and 40 cm. It is clear that population dynamics have changed over time, as indicated by changes in the relative numbers of fish at different sizes. There also appears to be some relationship between research CPUE and commercial fishing; however, uncertainty remains as to whether commercial fishing has caused changes in population demographics. It was suggested that improvements be made in the analysis of research CPUE data, thereby describing its variability, could improve this indicator. Furthermore, better knowledge of natural mortality, commercial fishing, proportion of Gilbert Bay cod in commercial catches, and movement patterns could also improve the understanding of the effects of fishing upon this population.

OBJECTIVE 1: DETERMINE IF THE INDICATORS, PROTOCOLS AND OR STRATEGIES IDENTIFIED BY SCIENCE ARE APPROPRIATE TO MONITOR THE GILBERT BAY COD POPULATION AGAINST THE COS FOR THE GILBERT BAY MPA.

The discussion proceeded with the review of the five indicators separately against Objective 1 from the Terms of Reference.

Indicator 1

An issue exists with the lack of correlation between this indicator and with age classes 2, 3, 4. This may be improved by looking at more otoliths of the age 2, 3, 4's. The question remains how much recruitment is needed to produce a strong year class. In response to questioning whether it would be easy to generate a recruit per spawner relationship, the presenter noted that this had been done before but that it was not exactly clear in its result either.

With respect to the sampling procedures associated with this indicator, there are 30-35 tows (divided between day and evening tows) in the Shinneys. Questions to the group: Is there any dissatisfaction with 15 tows (each time period) being used for this analysis (all tows are in the same region from one year to the next)?. Should there be more effort in other open parts of the Bay? Is it worth moving into the outer part of the Bay for sampling? The Chair suggested that this is a two part question: 1) is the sampling protocol for indicator 1 adequate for its purpose? 2) if not, can we suggest a change to the sampling protocol to improve the data obtained for this indicator? Answering the first question depends on the location of the spawners – therefore, the question should be is there any reason to expect that the age 0 would move beyond where they were spawned (outside of passive movement)? While there is no direct information on this we do expect the largest numbers of juveniles to be where the spawning occured.

Regarding the pelagic 0 group, there are two issues: 1) is the sample representative of is the existing population there (i.e., is the sampling protocol picking up real signal)? and 2) is the age 0 sample providing information about the population in the future? Confidence intervals for the number of age-0 pelagic juvenile cod sampled from the Main Arm and the Shinneys, are based on 15 tows; therefore, there must be pelagic 0 group larvae clustered in the water column. It was noted that there is the potential to get a single large catch that can affect the signal – posing the question of whether or not 15 tows is large enough to get a representative signal, or if clustering is causing changes in the signal. However, there was not a sense of certainty in the group surrounding whether or not the intensity of the sampling is enough to give a strong signal from the data. Therefore, for this indicator, the problem exists in spending a lot of time measuring the 0 group, but not being sure how to link that information with the older age class later on.

Chair's summary of discussion on Indicator 2, and suggestions:
Indicator 1 has issues in terms of being used as current indicator, but there is a sense that this provides useful information. Therefore, what could be done to improve this indicator to be able to use year class 0 strength to track cohorts through time? It was suggested that it is easier to answer these questions for Indicator 2. Going from age-0 to age-1 year class involves the consideration of many underlying factors (i.e. several times of high mortality and variability in that first year between 0 and 1 year class), making it hard to make that link between 0 and 1's.

The potentially useful information coming from the 0-age class includes growth rates and eating habits. This information also informs us about year to year variation. While this is not a suggestion for the improvement of this indicator it is a reason we would want this sampling take

place and continue. The presenter felt that if we were to rank this indicator it would not be as strong, and not as indicative, of the overall population as the other indicators. However, this indicator could provide information on potential trends that we currently do not understand. The Chair noted that we are not hearing agreement to this end from around the table. While this indicator appears useful for ecological information, it may not be useful as an indicator for measuring against the COs for the MPA. As it seems there are methodological problems with assessing this 0 group, as well as reasons for not considering this a useful indicator despite the ecological reasons for collecting these samples, it was suggested that the group move on to discuss Indicator 2 and come back to look at the suite of indicators before disqualifying an indicator on its own merits.

Indicator 2

Similar to comments on indicator 1, some participants again stated that the data for this indicator should be looking at areas of weak recruitment as opposed to trying to examine years of strong recruitment.

It was again questioned whether the collection of additional otoliths data, to determine the difference between different year classes, is important enough to increase the number of otoliths collected? It was also questioned whether the data from otoliths it would provide a sense of length-age-relationships variability within one year or not. Also, if there was more otolith data would it provide the same trends? The presenter stated that the initial feeling was not to kill more fish in order to determine the annual variability in growth rate.

With respect to the possibility of re-captured fish over time providing enough information for this indicator and using this as another way to obtain information on the difference in growth rates, it was felt that there are currently not enough individuals at this time to say whether this could be useful or not. It was recognized that this analysis struggles with a lot of information due to not knowing accurate ages. In the meantime, the key piece of information from this data is the variability in length at age for 2, 3, 4, age classes. Producing a length at age key for fish less than 45 cm wiould indicate variability in length at age of fish. Based on the observed variability, it might be possible to select and age fish from within a targeted size range, thereby limiting the number of fish sampled to provide data needed to improve recruitment information.

Regarding the usefulness of this indicator, it was noted that some additional sampling may be able to improve correlations between years 2 and 3's. There is potentially some gear selectivity issues at age 2; however, age 3's appear to be fully recruited to the gear. The lures used do not sample age 1 cod. While beach seining is a common method of sampling age 0 and 1 cod, unfortunately, the bolder habitat does not enable extensive beach seining at most sites in Gilbert Bay. Therefore little effort has been used to sample age 1 Gilbert Bay cod, resulting in little being known about their distribution.

Chair's summary of discussion on Indicator 2:
There is a sense that indicator 1 is now more useful to demonstrate years of poor recruitment in connection with indicator 2, particularly if indicator 2 is improved. Improvement to indicator 2, which might enable it better track various year classes, may also improve the correlation with indicator 1 data. In the meantime, some uncertainties related to indicator 2 could be improved if the age-length relationships for the 2, 3, 4 year classes were also improved through increased otolith sampling to better track year classes over time. It has been recommended that a one time take of 60-80 fish in total might be an acceptable number of fish to sacrifice to increase the certainty in this indicator.

Indicator 3

It was felt that indicator 3 required a measure of variability. Since there are only two people fishing a number of different sites, it may be useful to compute a catch rate separately for each site that would give a sense of variability between sites.

A large drop in CPUE in the beginning of the time series may be due to the fishery or another unforeseen reason (e.g. lack of food), but it could have also been biased by a few fishing periods with exceptionally high catch rates dominating the trend. Using error bars over time would also allow the determination of an actual increase or decrease not related to sampling variability. It agreed by the presenter that measuring sampling variability should be straight forward and that it would provide greater confidence in this indicator. However, the presenter also felt strongly that ability to catch fish in Gilbert Bay has decreased (from previous years) – a main reason they wanted this peer review. Notably, the researchers have been conscious of not biasing data by staying in areas that have high catch rates, even when trying to catch fish for sampling.

Chair's summary of discussion on Indicator 3:
This indicator is useful. However, there needs to be a measure of variability around catch per unit effort for each year in order to make it quantitative. This, in turn, would allow an assessment of changes between year to year that are representative of real changes in the population or simple variability of estimates.

Indicator 4

There is potential for fish to move beyond the boundaries of the MPA and become susceptible to a level of mortality. Currently, the data being analyzed come from hook and line sampling. Existing acoustic data can be used to indicate movements outside the MPA, but data collection and analysis for that purpose has been limited to this point. However, it has become clear that movement outside of the MPA boundaries is more of an issue than previously thought for the Gilbert Bay cod population.

It was noted by one participant that the changes in length frequency of fish caught at different sites could be used to infer the movement of fish. The question then arose whether traditional floy tags could provide useful maps for the purpose of studying movement outside the Bay. It was noted that there have been 48 tags returned from commercial fishing outside Gilbert Bay, however, the number of tags returned maybe far less than those caught.

The Chair posed the question: given these various ways of looking at indicator 4, is it telling us that Gilbert Bay cod are moving outside of the MPA? If so, is it giving us enough information about the movement (timing, duration etc.) to provide advice on adaptive management for the MPA? Additionally, why are the supposed (downward) trends from indicator 3 occurring?

The presenter noted that everything that was predicted based on tagging and recapture is confirmed with the acoustics data. What is *not* known is if the number of fish moving outside of Gilbert Bay in 1998 is the same as the number of fish moving outside today. It is also unknown whether the fish moving outside today have resulted from a change in the proportion of large fish in the Gilbert Bay cod population.

Chair's summary of discussion on Indicator 4:
Information using tags and change in size frequency distribution over the different seasons is being confirmed with acoustics information. With the placement of receivers in and around Gilbert Bay it should be possible to get a handle on this particular indicator. This information will tell us about the movement at present, but will not tell us about past movements under different conditions. Notably, this may change from year to year, and will therefore require a time series.

Indicator 5

It was suggested that Table 2 (Commercial Atlantic cod catches near Gilbert Bay, in areas where tagged Gilbert Bay cod have been recaptured) numbers may not be correct. Therefore, it was suggested that the presenter re-check these numbers and report back.

It was noted that the data presented at this time does not include the Labrador Metis Nation (LMN) 10 tonnes quota or sentinel catch rates, and that the data is based on the observation of the commercial fishery and dockside monitoring only. However, there is a high level of comfort with the commercial catch data, and particularly with 1998/99, i.e. reported vs. actual catch. The data provided from the DFO Statistics Branch includes: data on license holders, individual catch rates by area fished, per year.

The Chair asked if this indicator is a useful way to assess the fishing pressure on Gilbert Bay cod, supposing the information would have to be combined with information from indicator 4 (i.e. proportion of population moving outside of Gilbert Bay MPA).

In addition to knowing commercial fishery effects on the local cod population, it is important to consider changes in abundance of northern cod in addition to Gilbert Bay cod. It was noted that commercial Atlantic cod catch data can be influenced by changes in the abundance of cod outside the Gilbert Bay MPA. For example, an increase in Northern cod might decrease the proportion of Gilbert Bay cod in commercial landing. The presenter questioned this as a possible explanation for the outliers observed for 2007-08 data. Howver, LMN catch data will be useful because it is collected over a wider area, where we know Gilbert Bay cod do not go.

Potential methods to examine the proportion of Gilbert Bay and Northern cod were discussed, including aging the otoliths (i.e. Gilbert Bay cod are slow growing) and carrying out genetic studies. This methodology could carried out with the LMN catch and the otoliths that are collected and sent to DFO from sentinel fishery as well. A question was also raised about the potential benefit of having a Gilbert Bay cod catch rate from commercial fishing, i.e. standard index for catch rate if able to differentiate between Gilbert Bay cod and all others in the future. It was noted that this is currently being attempted using genetic clips from the sentinel fishery this year, and it is hopeful that this data can be used to assess the impact on Gilbert Bay cod.

With respect to discussions surrounding the usefulness of Sea Watch observers to discriminate Gilbert Bay cod from other cod based on coloration differences during the commercial fishery, it was felt that observer information would be useful in general as a source of additional information, but the question remains if whether there is enough confidence in the difference in color for observers to make a call on whether they are encountering Gilbert Bay cod. The presenter was not confident in the use of coloration and the level of uncertainty.

Chair's summary of discussion on Indicator 5:
The ability to distinguish between Gilbert Bay and Northern cod (i.e. fin clips for genetic analysis, etc.) is key to the accurate determination of the specific removal of Gilbert Bay Cod. A

useful management tool to improve the management of Gilbert Bay cod would be the ability to identify individuals belonging to this, and other populations. The application of emerging genetic tools is currently being explored to potentially address this question.

GENERAL DISCUSSION on the Suite of Indicators:

The Chair pointed out that there are pressures on the Gilbert Bay cod population, other than the fishery, which have not been discussed here. There is currently no ability to detect pressures from other things such as inter-annual variability, prey availability, changes in habitat, etc., and that these might be explored.

There was also an inquiry surrounding the potential for cannibalism in this population. While researchers have observed some incidence of cannibalism, there is no evidence of a significant effect due to this. The effect of cannibalism would usually be most prevalent when you have a lot of large cod – it is not often seen in the Gilbert Bay population and is therefore not likely a factor in poor recruitment.

Changes in the mortality of cod stocks can be due to various factors. Telemetry data may provide information on some sources of mortality. Keeping in mind that the monitoring program is the responsibility of Oceans and that Science should give a suite of potential indicators to them, we can continue to do the research into the next set of indicators that would be added to this current set.

The high importance of acoustics in the cod program in Smith Sound was noted – and how to make this applicable to the Gilbert Bay population was discussed. It was pointed out that little can be done with a sub-optimal number of tags. Between 50-100 tagged fish would be a good number of tagged fish for Gilbert Bay in order to determine how many fish go outside the MPA and where they spend considerable amounts of time. As the receivers for this type of monitoring are already in place the tags would be the only capital expenses. Increased information on movement of cod outside the Bay would be useful to understanding fishing mortality and would also provide more information on natural mortality.

OBJECTIVE 2: IF THE CURRENT INDICATORS ARE DEEMED APPROPRIATE, ASSESS THE RESULTING DATA TO CHARACTERIZE THE STATUS AND TRENDS FOR THE LOCAL COD POPULATION AS IT RELATES TO THE COS FOR THE GILBERT BAY MPA

There was some discussion regarding spill-over of cod outside the MPA boundaries, collection of information inside and outside the boundaries and how this relates to COs for the Gilbert Bay MPA and activities that take place outside the MPA. A participant asked if the COs for the MPA are independent or dependent on the threats to the cod? The presenter feels that it is independent. Currently, Oceans Branch is preparing to renew the Management Plan (est. 2010) for the Gilbert Bay MPA since many of these discussions have come up since the original plans were set out.

The Chair directed the discussion back to the issue of the sufficiency of the indicators. While these indicators do appear relevant and useful, extended analysis that can be done quickly and easily is needed before one would be comfortable saying there is a clear downward trend, and that it is significant.

It was the view of researchers working in Gilbert Bay that the conditions have changed and that it is not surprising that the monitoring (based on fish not moving outside) may be insufficient. The presenter felt that the indicators do indicate what the cod are doing and, based on the indicators as a whole (keeping in mind the improvements needed), suggest that the Gilbert Bay cod population has decreased.

Regarding the information on fish movements (moving outside the MPA and being caught in commercial fishery), it was discussed whether we can make a conclusion on the status of the population at the moment? One participant pointed out that we are actually only getting an indication of decline from the CPUE (decrease over time) and recruitment indicators.

The discussion hovered around the data demonstrating a decrease in the recruitment of the population. We see periods of recruitment failure (i.e. year class 2), but is that enough to say that the population has changed from 1998-99 or is there more information that is needed? To those not working directly with the data it does not stand out – other than a potential big catch in the first year. It was felt that part of this observation is related to the scaling on the CPUE graph where the scale is so small that a huge change in the population becomes a small change in that graph.

The Chair posed the questions back to group – with the information on the table today can we assess the status of the population at this time? While it was agreed that the current suite of indicators are relevant and useful, suggesting using them with the discussed improvements and re-analysis, it was not felt that they provide an absolute status of the Gilbert Bay cod population.

In addressing the question whether a relationship can be made between spawners and recruits that would provide a better idea of recruitment failure in various years, the response was no. There may be some value in exploring this relationship – particularly if additional fish are sampled to accurately determine age. However, a potential problem with using a spawner-recruit relationship might be misinterpreting the age of recruits, resulting in "noisy" data. Again, if we were aging year classes 2, 3, 4's the value of this relationship could be improved.

It was suggested by a participant that matching the second triangle of weak class with fishing effort corresponds with a time of no fishing. Therefore, there is evidence in the data for a lack of recruits in the population, but there is not a clear linkage with fishing pressure.

The Chair asked if this was a consensus from this meeting.

In the meantime, the perspective of a resident from William's Harbour is that there is concern in the area that the stock is declining based on observation.

The presenter noted that evidence of population demographic changes, coupled with few young fish in the population, does not provide a positive outlook for population growth in the near future and is a cause for concern.

It was discussed whether Northern cod are episodic recruiters or continuous recruiters and whether the observed variable recruitment pattern is in or out of line with other cod populations. Among Atlantic cod in general, recruitment pattern can be highly variable and the observation in Gilbert Bay is probably not out of line with other population patterns. In considering how we might use the information related to poor cod recruitment to assess if the Gilbert Bay MPA is meeting its CO or not, it was questioned whether there is enough evidence here, one way or the other to this respect? While we cannot say that recruitment has been poor over the entirety of

the last 15 years, we also don't know what 'good' is for this stock. Out of the last 10 years, 6 years potentially look poor for recruitment.

Are indicators sufficient to assess episodic as well as continuous recruitment? What do they mean in terms of a reference level and could this probably be explored? Could one of the next steps be exploring and determining the appropriate reference points for this population? A participant noted that this can definitely be explored but it may not necessarily determine appropriate reference points since this cannot even be done for cod that we have years of data for. However, it is useful to start somewhere.

The Chair remarked that in order to make recommendations on a need for management response we should explore the development of reference points that are linked to the population indicators that are measured and include targets and timeframes.

The Chair again asked if there is a sense from the rest of the group that the indicators we have evaluated are sufficiently strong enough to warrant the conclusion that an unknown number of spawners are being removed from the population by commercial fishing and that an overall decline of the population is taking place due to this pressure?

The presenter felt that if the CPUE data can be improved then we can improve the confidence that commercial fishery is driving that trend. However, issues remain with respect to this conclusion. There still needs to be a better understanding of the pressures on the population as we do not want to point all of the stress to a single particular stressor. For example, there was a period of poor recruitment that occurred after the 1998-99 fisheries inside the Bay and then another year of poor recruitment without a fishery inside the Bay.

With respect to recommendations, it is important to remember that DFO Oceans can only manage things over which they have some control. Therefore, recommendations related to managing changes in recruitment based on, for example, the North Atlantic Oscillation (NAO) are not an option. However, participants of this meeting may recommend management approaches that deal with stressors that are under management control, i.e. size of MPA, fishing, habitat disruption, etc.

The Chair summarized the discussion of the second objective which dealt with the assessment of the local cod population of Gilbert Bay. Overall, the group agreed that the indicators are appropriate for use towards this objective, and that they do suggest a decline in the population; changes in demographics; and that there is potential for further decline in recruitment. Given this decline we need to study further the effect of stressors (i.e. natural and anthropogenic stressors) on the status of this population. It will also be necessary to explore reference levels for this population. Some of this can be done with indicators from the current data.

The Chair then made some closing remarks. The next steps include the writing of a Science Advisory Report (SAR) and Research Document with suggestions on improvements that the presenter of the working paper will prepare. A Proceedings document will be produced documenting the discussions. The SAR will summarize the consensus on the two objectives and reiterate the recommendations on the indicators. Participants are asked to please review the SAR when circulated and ensure their consensus are reflected in the SAR. This will be a public document and important that people review. The Chair thanked all for participation.

RESEARCH RECOMMENDATIONS

- Research is required to develop or improve indicators for monitoring natural and anthropogenic pressures on the Gilbert Bay cod population.

- To increase the understanding of natural and anthropogenic influence on the Gilbert Bay cod population, indicators for other pressures on population should also be developed. These pressures include changes in habitat, changes in prey type, abundance, and distribution (stomach contents may be useful for this), and variation in natural mortality.

- Potential drivers of the Gilbert Bay MPA regional ecosystem may be considered with/ incorporated into the analysis of Gilbert Bay cod population trends over time. For example, climate indices, chlorophyll a, etc.

- Given recent advances in telemetry and the current telemetric infrastructure in place for monitoring the Gilbert Bay cod population, enhancing the use of telemetry to indicate movements of large cod between the MPA and adjacent areas would prove useful to further understanding sources of mortality of Gilbert Bay cod.

- Reference levels for the population should also be explored to provide a benchmark against which to determine population status.

REFERENCES

DFO. 2010. Review of the Gilbert Bay Marine Protected Area monitoring indicators, protocols and strategies, and an assessment of the Gilbert Bay cod population. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/027.

Morris, C. J. and Green J. M. 2010. Gilbert Bay Marine Protected Area science indicator monitoring. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/060.

APPENDIX I: Meeting Agenda

DFO Science Review of the Gilbert Bay MPA Monitoring Protocol
Regional Advisory Process (RAP)
October 22, 2009
Holiday Inn, 180 Portugal Cove Road, St. John's, NL

Meeting Chairperson: Robin Anderson, Marine Habitat Research Scientist, Environmental Science Division, Science Branch, NL Region

Thursday 9 AM	Opening/Chair remarks/ToR
	DFO Science Requirements of under Health of the Oceans (HOTO) (15 mins) – Nadine Templeman
	Oceans monitoring report on Gilbert Bay MPA (20 mins) – Jennifer Janes
	Gilbert Bay MPA Monitoring Protocol (40 mins) – Corey Morris
	Follow-up discussion
12-1 PM	Lunch Break
	General discussion and preparation of Science Advisory Report (SAR)

* There will be a morning and afternoon coffee/tea break.

APPENDIX II: Terms of Reference

Meeting of the Newfoundland and Labrador Regional Advisory Process (RAP) on Gilbert Bay Marine Protected Area (MPA) Monitoring Protocol

Holiday Inn, 180 Portugal Cove Road, St. John's, NL
October 22nd 2009

Meeting Chairperson: Robin Anderson, Marine Habitat Research Scientist, Environmental Science Division, Science Branch, NL Region

TERMS OF REFERENCE

Context

Under the Health of the Oceans (HOTO) initiative, DFO Science is required to provide support and advice on Marine Protected Areas to DFO Oceans Management. Currently, this includes Science identifying indicators, protocols and strategies that are to be incorporated into MPA monitoring plans to be carried out by Oceans. The identification of such indicators, protocols and strategies are to be based upon the regulatory COs (COs) set out for each particular MPA. For the Gilbert Bay MPA, the CO is to protect and conserve a unique population of Atlantic cod and its habitat. This MPA is largely a community derived initiative, and as such, the monitoring strategy must consider the methods and measureables appropriate for community based participation and decision making.

The monitoring of biological and ecological indicators (and their respective threats) is essential to: a) the development of a broader MPA monitoring "plan" or "program" (which would include socio-economics); b) tracking status, condition and trends to determine if MPAs are effective in achieving their COs; c) aiding mangers in the adjustment of MPA management plans to achieve their COs; and d) reporting to Parliament and Canadians.

Science monitoring products are not intended to address non-biological/ecological aspects of monitoring (with the exception of *threats* as presented by human activities).
Selection of indicators and protocols for collection and analysis of data must be scientifically defensible. Science will not be examining social, economic or cultural indicators.

Given that Science in support of the Gilbert Bay initiative has been ongoing (both pre- and post-MPA designation) for several years, this process will require taking into consideration the indicators that have been used to date, advising on their suitability for measuring against the existing COs for Gilbert Bay, identifying other potentially important indicators where required, and if appropriate, assessing trends in the available indicator data to assess the status of the Gilbert Bay cod population.

Objectives

Overall objectives of the meeting are to:

- Determine if the indicators, protocols and or strategies identified by science are appropriate to monitor the Gilbert Bay cod population against the COs for the Gilbert Bay MPA.
- If the current indicators are deemed appropriate, assess the resulting data to characterize the status and trends for the local cod population as it relates to the COs for the Gilbert Bay MPA.

Specifically, five proposed indicators related to the Gilbert Bay cod population will be assessed, and advice to accept and/or improve the various indicators will be developed. The five indicators proposed for use in monitoring the Gilbert Bay cod population are:

6. Recruitment of age 0 pelagic juvenile abundance
7. Recruitment, relative abundance, and year class strengths based on age 2,3 and 4 year old Gilbert Bay cod
8. Catch Per Unit Effort (CPUE)
9. Movement patterns in relation to population demographics and MPA boundaries
10. Localized commercial, recreational, sentinel, and aboriginal catch rates and fishing effort.

Advice to improve the above indicators for their relevance to the COs will consider:

- Major sources of uncertainty and potential for improvement
- Implications of potential fishing pressure upon future population growth rates in the short and medium term.
- New sources of information

Products
A Science Advisory Report (SAR) and associated research document(s) will be produced.
A Proceedings Report will record the meeting discussions.

Participation will be solicited from:
- DFO Science Branch, NL Region
- DFO Oceans Branch, NL Region
- DFO Fisheries and Aquaculture Management Branch, NL Region
- The Labrador Metis Nation
- Provincial Department of Fisheries and Aquaculture
- Memorial University

APPENDIX III: Cadre de référence

Réunion du Processus de consultation scientifique régional (PCSR) de Terre-Neuve et du Labrador sur le protocole de surveillance de la zone de protection marine (ZPM) de la baie Gilbert

Holiday Inn, 180, Portugal Cove Road, St. John's, T.-N.-L.
Le 22 octobre 2009

Président de la réunion : Robin Anderson, chercheur scientifique, habitat marin, Division des sciences environnementales, Direction des sciences, Région de T.-N.-L.

CADRE DE RÉFÉRENCE

Contexte

En vertu de l'initiative Santé des océans, le secteur des Sciences du MPO doit fournir soutien et avis concernant les zones de protection marine à Gestion des océans du MPO. Actuellement, cette fonction suppose la désignation d'indicateurs, de protocoles et de stratégies qui seront intégrés dans des plans de surveillance des ZPM élaborés par le secteur des Océans. La désignation de tels indicateurs, protocoles ou stratégies doit être fondée sur les objectifs réglementaires de conservation établis pour chaque ZPM particulière. Dans le cas de la ZPM de la baie Gilbert, l'objectif de conservation est de protéger une population unique de morue franche et son habitat. Cette ZPM découle, dans une vaste mesure, d'une initiative communautaire, et c'est pourquoi la stratégie de surveillance doit reposer sur des méthodes et des résultats mesurables qui permettent à la communauté de participer aux activités et à la prise de décisions.

Il faut mener des activités de surveillance des indicateurs biologiques et écologiques (et de leurs menaces respectives) afin : a) d'élaborer un « plan » ou un « programme » de surveillance plus vaste des ZPM (comprenant un volet socio-économique); b) d'effectuer un suivi de l'état de la population, de la condition de la morue et des tendances pour déterminer s'il est possible d'atteindre les objectifs de conservation des ZPM; c) d'aider les gestionnaires à mettre au point des plans de gestion des ZPM qui permettront l'atteinte des objectifs de conservation; d) de faire rapport au Parlement ainsi qu'aux Canadiens.

Les documents scientifiques portant sur la surveillance ne traitent pas des volets de la surveillance non liés à la biologie ou à l'écologie (à l'exception des *menaces* d'origine anthropique). Le choix d'indicateurs et de protocoles pour la collecte et l'analyse de données doit être valable sur le plan scientifique. Le secteur des Sciences n'examinera pas les indicateurs sociaux, économiques ou culturels.

Étant donné que les Sciences soutiennent l'initiative de la baie Gilbert depuis plusieurs années (avant et après la désignation de la ZPM), le présent processus devra prendre en considération les indicateurs qui ont été utilisés à ce jour, et le secteur devra formuler un avis concernant leur à-propos pour la mesure des progrès en regard des objectifs de conservation actuels établis pour la baie Gilbert, désigner d'autres indicateurs potentiellement importants (au besoin) et, le cas échéant, établir les tendances touchant les données dérivées des indicateurs disponibles afin d'évaluer l'état de la population de morue de la baie Gilbert.

Objectifs

Les objectifs généraux de la réunion sont les suivants.

- Établir l'à-propos des indicateurs, des protocoles ou des stratégies désignés par les Sciences afin de mener des activités de surveillance de la population de morue de la baie Gilbert en regard des objectifs de conservation établis pour la ZPM de la baie Gilbert.
- Si les indicateurs actuels sont jugés comme étant appropriés, évaluer les données obtenues grâce à ces derniers afin de caractériser la situation et les tendances relatives à la population locale de morue en regard des objectifs de conservation établis pour la ZPM de la baie Gilbert.

Plus particulièrement, on évaluera cinq indicateurs proposés pour la population de morue de la baie Gilbert et on formulera un avis concernant l'acceptation ou l'amélioration des différents indicateurs. Les cinq indicateurs dont l'utilisation est proposée pour les activités de surveillance de la population de morue de la baie Gilbert sont les suivants.

11. Recrutement et abondance des juvéniles pélagiques d'âge 0.
12. Recrutement, abondance relative et effectifs des classes d'âge des morues de la baie Gilbert d'âges 2, 3 et 4.
13. Prises par unité d'effort (PUE).
14. Habitudes migratoires selon les caractéristiques démographiques de la population et les limites de la ZPM.
15. Taux de prise et effort des pêches commerciales, récréatives, sentinelles et autochtones selon le lieu.

On tiendra compte des points suivants durant la formulation de l'avis concernant l'amélioration des indicateurs susmentionnés en regard des objectifs de conservation.

- Principales sources d'incertitude et potentiel d'amélioration.
- Impact des pressions potentielles exercées par la pêche sur les taux de croissance de la population à court et à moyen termes.
- Nouvelles sources de renseignements.

Produits

Un avis scientifique (AS) et un ou plusieurs documents de recherche connexes seront produits. Un compte rendu résumera les discussions tenues pendant la réunion.

La participation des organismes suivants sera sollicitée.

- Secteur des Sciences du MPO, Région de T.-N.-L.
- Secteur des Océans du MPO, Région de T.-N.-L.
- Secteur de la Gestion des pêches et de l'aquaculture du MPO, Région de T.-N.-L.
- Nation des Métis du Labrador
- Ministère provincial des Pêches et de l'Aquaculture
- Université Memorial

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APPENDIX V : Figure of Gilbert Bay Management Zones